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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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10/520,125

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Shigeki Yamate

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EXAMINER

ENIN-OKUT, EDU E

ART UNIT

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/520,125	Applicant(s) YAMATE, SHIGEKI	
	Examiner Edu E. Enin-Okut	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 11 May 2009.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-11 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-11 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
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| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

NONAQUEOUS ELECTROLYTE SECONDARY CELL***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on May 11, 2009 has been entered. Applicant has added claim 11. Claims 1-11 are now pending.

Claim Rejections - 35 USC § 103

2. Claims 1-4 and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimamura et al. (US 6,090,505) in view of Ehrlich (US 2003/0064291) is maintained. Additional supporting evidence is provided by M. N. Rahaman, *Ceramic Processing and Sintering*, Second Edition, 2003.

Regarding claim 1, Shimamura teaches a non-aqueous electrolyte secondary battery (Title; Abstract) comprising: a negative electrode with a composite layer containing a negative active material (Abstract; 5:9-13, 5:20-25); a positive electrode [metal lithium electrode] (5:14-17, 7:12-17); and a non-aqueous electrolyte [organic electrolyte] (5:17-19, 14:13-14); and, characterized in that said negative active material is an alloy [solid phase A + solid phase B]; and said alloy contains Sn₄Ni₃ phase [solid phase B] and Sn phase [solid phase A, Ni₃Sn₂] (Sample 66 on Tables 2(A) - 2(B)).

Shimamura does not explicitly teach that the alloy contains 5 to 25 mass % of nickel and 75 to 95 mass % of tin.

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However, the reference does teach the alloy having a 27 mass % of Ni and 73 mass % of Sn which showed a sustainable high charge-discharge capacity and, in turn, excellent cycle characteristics (Sample 66, Table 2(B), 8:48-53).

Ehrlich teaches a negative electrode material for a lithium-ion electrochemical cell, made of a mixture of 5 to 90 wt. % nickel particles and 10 to 95 wt. % tin particles, with improved cell capacity and cycle life performance (Abstract; para. 9).

It has been held that obviousness exists where the claimed ranges and prior art ranges do not overlap but are close enough that one skilled in the art would have expected them to have the same properties. *Titanium Metals Corp. of America v. Banner*, 778 F.2d 775, 227 USPQ 773 (Fed. Cir. 1985). See MPEP 2144.05 (I). Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the alloy of Shimamura in view of Ehrlich in the negative electrode of the non-aqueous battery of Shimamura, with the mass percentages of those components as recited in claim 1, because an alloy of this composition is known in the art to produce a negative electrode that increases battery reliability, safety, cycle performance, capacity and charge-discharge characteristics (see Shimamura, Abstract).

Regarding claim 2, Shimamura teaches that the content ratio of said Sn_4Ni_3 phase and said Sn phase in said alloy is $0.7 \leq Z \leq 19$ when m_1 is the mass of said Sn_4Ni_3 phase [40-95%], m_2 is the mass of said Sn phase [5-60%], and $Z=m_1/m_2$ (Claim 7).

Since it has been held that obviousness exists where the claimed ranges overlap or lie inside ranges disclosed by the prior art where the general conditions of a claim are disclosed in the prior art (e.g., *In re Wertheim*, 541 F.2d 257, 191 USPQ 90 (CCPA 1976); *In re Woodruff*, 919 F.2d 1575, 16 USPQ2d 1934 (Fed. Cir. 1990)), and it is not inventive to discover the optimum ranges by routine experimentation, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the alloy

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of Shimamura in the non-aqueous battery of Shimamura, as modified by Ehrlich, with a content ratio as recited in claim 1 for the reasons recited above. See MPEP 2144.05 (I) and (VI).

Regarding claim 3, Shimamura teaches that the composite layer contains carbon material [acetylene black] (5:20-25). It is noted that Applicant discloses an acetylene black as an example of a graphitic carbon material on p. 7, line 2.

Regarding claim 4, as to the composite layer containing a carbon material, this limitation has been addressed above with respect to claim 3.

As to when n_1 is the mass of the alloy, n_2 is the mass of said carbon material, and $S=n_1/n_2$, S falls within the range of $0.05 \leq S \leq 3.5$, Shimamura teaches a negative electrode material paste formed from 85 wt. % negative material powder, 10 wt. % binder and 5 wt. % conductive agent of acetylene black (5:20-25). The reference also teaches that the conductive agent, i.e., a carbon powder, can be varied from 5-80 wt. % (15:1-5; Claim 24).

If the amount of the binder of Shimamura remains approximately the same as the amount of its carbon powder in the negative electrode material paste is varied, and the amount of the negative material powder is varied accordingly, the S values taught by Shimamura is approximately from 0.0125 to 17.

Since it has been held that obviousness exists where the claimed ranges overlap or lie inside ranges disclosed by the prior art where the general conditions of a claim are disclosed in the prior art, it would have been obvious to one of ordinary skill in the art at the time of the invention to use the alloy of Shimamura in the non-aqueous battery of Shimamura, as modified by Ehrlich, with an S value as recited in claim 4, to produce a battery with sustainable high discharge capacity and prevent the lowering of its electron conductivity and cycle characteristics (see Shimamura, 15:6-13).

Regarding claims 8, 9 and 10, Shimamura in view of Ehrlich teaches a negative electrode material density of greater than about 5 g/ml found using helium pycnometry (see Ehrlich, Abstract, para. 37). One of ordinary skill would appreciate is 5 g/ml is equivalent to 5 g/cm³ and that helium pycnometry

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is well known in the art as a method used to determine the apparent density of a material (see M. N. Rahaman, *Ceramic Processing and Sintering*, Second Edition, p. 156).

3. Claims 5, 6 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Shimamura et al. and Ehrlich as applied to claims 1-4 and 8-10 above, further in view of Tsutsue et al. (US 2002/0006548) is maintained.

Shimamura and Ehrlich are applied and incorporated herein for the reasons above.

Regarding claims 5, 6 and 7, as to the composite layer using a powdered negative active material, this limitation has been addressed above with respect to claim 4.

As to the porosity of the composite layer being 30 to 75%, Tsutsue teaches that a thin, light-weight polymer electrolyte battery of high capacity density can be produced by optimizing the porosity of a layer of electrode active material mixture containing a polymer (Abstract; para. 12). The preferred porosity of the layer of negative electrode active material is from 35 to 45% (para. 18). The amount of polymer in the negative electrode active material mixture ranges from 7 to 16 wt. % (para. 21).

Therefore, it would have been obvious to one of ordinary skill in the art at the time of the invention to optimize the porosity of the composite layer of Shimamura, as modified by Ehrlich, to obtain a layer having a porosity in the range as recited by claim 5, as taught by Tsutsue, to produce a battery that is thin, light-weight and has a high capacity density.

4. Claims 1 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Kasamatsu et al. (US 6,605,386) in view of Kajiura et al. (JP 2001-143700; refer to JPO Abstract and machine translation).

Regarding claims 1 and 11, Kasamatsu teaches a non-aqueous electrolyte secondary battery composed of positive and negative electrodes, and a non-aqueous electrolyte (Abstract). The negative electrode active material is composed of a solid phase A composed of tin (Sn) and a solid phase B

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composed of an intermetallic of tin and at least one element selected from transition elements, such as nickel and iron (4:41-51).

Kasamatsu does not expressly teach that the intermetallic is a Sn_4Ni_3 .

However, Kasamatsu does teach solid phases A and B of Sn and FeSn_2 where Sn:Fe = 70:30 atomic percent (Table 1). Further, Kajiura teaches a non-aqueous electrolytic secondary cell including a negative electrode active substance including a simple Sn phase and an intermetallic, such as Ni_3Sn_4 (Abstract; machine translation, para. 11). Kajiura also teaches that a battery including an intermetallic of Ni_3Sn_4 exhibits a higher service capacity and coulomb efficiency than one employing an intermetallic of FeSn_2 (machine translation, para. 64, 73, 74).

Thus, it would have been obvious to one of ordinary skill in the art at the time of the invention to use an intermetallic phase such as Ni_3Sn_4 when forming the negative active material alloy used in secondary battery of Kasamatsu because Kajiura teaches that a battery incorporating an intermetallic of Ni_3Sn_4 exhibits a higher service capacity and coulomb efficiency.

As to the percentages of nickel and tin in the alloy, one would appreciate that the negative active material alloy used in the negative electrode of Kasamatsu, as modified by Kajiura, teaches Sn:Ni of 70:30 atomic percent, which is equivalent to about 83 wt. % of tin and 17 wt. % of nickel.

As to Sn having a peak lying in the range of $30.5^\circ \leq 2\theta \leq 30.8^\circ$ in x-ray diffraction obtained with $\text{CuK}\alpha_1$ radiation, applicant states that its alloy may be manufactured using methods such as a mechanical milling method on p. 4 of the instant specification. Kajiura teaches that a negative electrode active substance including a simple Sn phase and a Ni_3Sn_4 intermetallic phase can be produced using a ball milling operation (machine translation, para. 45). Thus, it would have been obvious to form the negative active material used in the battery of Kasamatsu, as modified Kajiura, using a mechanical milling method because Kajiura teaches that its is a means with which to form this type of material, as discussed above. Further, since the negative active material of Kasamatsu, as modified by Kajiura, and the instant invention

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have similar compositions and are produced in a similar manner, it is the position of the examiner that a property such as the recited Sn x-ray diffraction peaks obtained with $\text{CuK}\alpha_1$ radiation are inherent. A reference which is silent about a claimed invention features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. *In re Robertson*, 49 USPQ 1949 (1999). See MPEP 2112.

Response to Arguments

5. Applicant's arguments filed May 11, 2008 have been fully considered but they are not persuasive.

6. With respect to applicant's argument regarding the following phrase recited in claim 1, "... said alloy contains Sn_4Ni_3 and Sn phase ..." (see its remarks on p. 9-10) , as stated in the Final Office Action issued on December 10, 2008, the recitation as presented does not exclude a Sn phase made of a material including tin and other elements, such as a Ni_3Sn_2 described by the Shimamura reference. Further, one of ordinary skill in the art would appreciate that the negative active material taught by Shimamura containing 57 atomic % Sn (see Shimamura, Table 2(A), Sample No. 66) includes solid phases Ni_3Sn_4 , Ni_3Sn_2 , and a pure Sn phase [emphasis added] (see Ni-Sn (Nickel-Tin) of *Journal of Phase Equilibria and Diffusion*). Further, there is no discussion in the Shimamura reference about its electrode materials being "rapidly" quenched. Thus, applicant's contention that this treatment precludes the electrode material of the Shimamura reference from having a pure Sn phase is unpersuasive (see its remarks on p. 11).

Contact Information

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Any inquiry concerning this communication or earlier communications from the examiner should be directed to **Edu E. Enin-Okut** whose telephone number is **571-270-3075**. The examiner can normally be reached on Monday - Thursday, 7 a.m. to 3 p.m. (EST).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Dah-Wei Yuan can be reached on 571-272-1295. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Edu E Enin-Okut/
Examiner, Art Unit 1795

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